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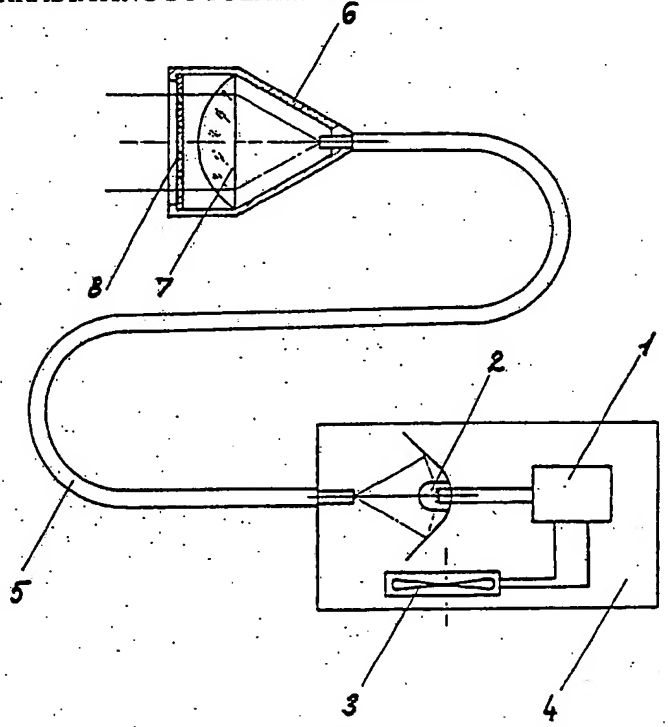
(54) Title: APPARATUS FOR IRRADIATING BY POLARISED LIGHT



(57) Abstract

In an apparatus for irradiating by polarised light, comprising means for generating polarised light (8) and a housing (4) including an electric supply unit (1), an incandescent lamp (2) with a mirror attached thereto and a cooling fan (3), an irradiating head (6) is applied for reflecting polarised light, wherein the irradiating head (6) is connected to the housing by a flexible fibre optics means (5) and made thereby independently movable on the housing (4). The apparatus as proposed doesn't cause any heat load to the surface to be irradiated.

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APPARATUS FOR IRRADIATING BY POLARISED LIGHT

The invention refers to an apparatus for irradiating by polarised light comprising means for generating polarised light and a housing including an electric supply unit, an incandescent lamp with a mirror attached thereto and a cooling fan. The apparatus as proposed can be applied as healing means for irradiating internal and external surfaces of a living body, for carrying out acupuncture treatments and for industrial and agricultural processes requiring polarised light.

The apparatuses generating polarised light as they have been known comprise an incandescent lamp for generating light and means for generating polarised light, wherein the different units of the optical system form a rigid structure with elements fixed on predetermined place. The apparatus together with the incandescent lamp should be displaced as a whole unit.

An apparatus capable of generating polarised light is described in the patent specification HU-B 186 081. This apparatus consists of two main units, i.e. an electric supply unit and an irradiating head. The irradiating head includes an incandescent lamps with light deflecting elements, means for generating polarised light and a cooling fan. The electric supply unit is connected with the irradiating head by an electric conductor. This solution has the particular disadvantage of generating a considerable amount of heat which requires the application of the cooling fan which results in increased geometric dimensions of the irradiating head. The electric contact between the irradiating head and the electric supply unit should be realised with high reliability and therefore the electric security has to be ensured by specific solutions.

Another apparatus is described in the published patent specification DE-A1 27 17 233, wherein the irradiating

head is equipped with an interference filter and a heat filter over the mentioned incandescent lamp, optical deflecting elements and the cooling fan.

In this apparatus the heat filter ensures absorption of the infrared radiation and this means a very intensive local heat source over the heat load resulted from the radiation of the incandescent lamp.

Thus, the known apparatuses show the common feature of comprising an incandescent lamp in a housing including means for generating the polarised light and a cooling fan necessarily applied because of the high heat load. The irradiating head including the mentioned units is relatively heavy, has great dimensions and generates much heat in the environment of application. This all makes the apparatus be difficult in the use especially for medical treatments, for irradiating living bodies.

A further disadvantage should be seen in the fact that the incandescent lamp is displaced near to the place of the application of the apparatus, and this results in the requirement of increasing the electric security level in order to avoid the possible misuse problems.

The object of the present invention is to create an apparatus free of the mentioned disadvantages. A solution thereof is to transmit the radiation energy to the surface to be irradiated by means of fibre optics means not applied up to date in this field whereby the incandescent lamp can be place as far from the place of irradiating as desired.

The invention is based on the recognition that the incandescent lamp and the cooling fan attached thereto has to be arranged far from the required place of irradiating and fibre optics means should be applied for transmitting the optical radiation necessary for generating the polarised light. Thereby the mass and the geometric dimensions of the irradiating head can be considerably diminished and the environment of the irradiating is not loaded by high heat radiation power. The fibre optics means are generally made of

a material being electric insulator, hence, the electric security problems are avoided, too.

The apparatus for irradiating by polarised light as proposed by the present application comprises means for generating polarised light and a housing including an electric supply unit, an incandescent lamp with a mirror attached thereto and a cooling fan, wherein an irradiating head is applied for applying polarised light connected by fibre optics means with the incandescent lamp and the irradiating head is movable arranged.

In another way, the apparatus for irradiating by polarised light includes a light source, means for generating polarised light and means for projecting irradiating light beam in predetermined directions, wherein radiation power is transmitted from the oight source to a separate irradiating head by flexible fibre optics means, wherein the irradiating head includes the projecting means.

In the most preferred embodiment of the apparatus as proposed by the invention the means for generating polarised light are arranged in the irradiating means. In the irradiating head the polarised light is generated preferably by a polarising filter or a reflecting surface arranged under the Brewster's angle thereof. The generating means can be arranged directly on the output of the fibre optics means or after a condenser lens or a Fresnel lens built into the irradiating head on the output of the fibre optics means.

The geometry of the output surface of the fibre optics means can be shaped very advantageously for ensuring the light intensity distribution characteristics of a point form light source - this has been impossible when applying an incandescent lamp - and euqipping it with light deflecting elements it is possible to obtain light beams characterised by considerably higher parallelity than in the known apparatuses. Hence, the degree of the polarisation of the light can be improved.

The invention will be further described on the basis of preferred embodiments shown by way of example, with reference to the attached drawings. In the drawings

Figure 1 shows the functional elements of the apparatus as proposed by the invention in their connections,

Figure 2 represents the cross-section of an irradiating head realised with a Fresnel lens,

Figure 3 is a cross-section of an irradiating head realised with a Brewster's angle reflecting surface and a condenser lens,

Figure 4 shows a cross-section of an irradiating head realised similarly to that of Figure 3, but with a Fresnel lens and

Figure 5 represents the cross-section of a tubularly shaped iraddiating head equipped with a polarising filter.

Description of the preferred embodiments

The apparatus as shown in Figure 1 and proposed by the invention is connected to an electric supply unit 1 arranged in a housing 4. This unit can be a simple socket for an incadescent lamp 2, connected to a network terminal. The incandescent lamp 2 with a mirror system attached thereto is arranged also in the housing 4, wherein a cooling fan 3 serves to diminishing the heat load of the apparatus. The mirror system of the incandescent lamp 2 is arranged before an input terminal of fibre optics means 5 connnecting the housing 4 with an irradiating head 6.

According to the invention the polarised light is advantageously generated by means arranged in the irradiating head 6. One of the possibilites is shown in Figure 1: at the end of the irradiating head 6 there is a polarising filter 8 arranged oppositely to a condenser lens 7 closing the outout terminal of the fibre optics means.

The irradiating head 6 can be realised also with a Fresnel lens (Figure 2.) signed by 9 which is arranged in

in a spaced relationship to the output terminal of the fibre optics means 5. This spaced relationship is determined by the focal distance of the Fresnel lens 9.

Another solution is shown in Figure 3 wherein an irradiating head 6a comprises a reflecting surface 10 arranged under the Brewster's angle. On the output of the fibre optics means 5 there is here also a condenser lens 7 arranged on the distance of its focal length.

The irradiating head 6a shown in Figure 3 can be realised also by means of a Fresnel lens 9 instead of the condenser lens 7, as proposed by the arrangement of Figure 4. The Fresnel lens 9 is arranged, similarly to Figure 2, in a distance from the output terminal of the fibre optics means 5, this distance being equal to the focal length of the Fresnel lens 7.

In lots of applications it can be very advantageous to make use of a tubular irradiating head shown in Figure 5 and signed by 6b. In this embodiment a polarising filter 11 is arranged directly at the output of the fibre optics means 5, without applying any condensing element.

As it can be seen in Figure 1, the light of the incandescent lamp 2 is reflected by an appropriate surface to the fibre optics means 5, whereby the last transmits the radiation of the incandescent lamp 2 to the irradiating head 6, 6a or 6b. The output beam of the fibre optics means 5 is made parallel by the condenser lens 7, the output beam of which is processed by the polarising filter 8. This is the way whereby the irradiating head 6 produces the polarised light to be applied.

For making the output beam of the fibre optics means 5 parallel a Fresnel lens is applied according to Figure 2. The parallel light beam produced by the Fresnel lens 9 falls onto the polarising filter 8 wherefrom the linear polarised light components are selected and transmitted. The output polarised light of the irradiating head 6 can be directed to

the surface of treatment by directing the irradiating head in a required space position.

The output light beam of the fibre optics means 5 can be polarised also by means of a Brewster's angle reflecting surface 10. According to Figure 3, an irradiating head 6a is then realised by a condenser lens 7 for making the output light beam of the fibre optices means 5 parallel. This parallel light beam is polarised by the Brewster's angle reflecting surface and the polarised light can be directed to the required surface by displacing the irradiating head 6a into a direction selected during the treatment.

The output beam of the fibre optics means 5 can be made parallel also by means of a Fresnel lens 9 as shown in Figure 4. This arrangement includes also the Brewster's angle reflecting surface 10. The parallel light beam is processed by the reflecting surface 10 producing a polarised light beam to the directed to the surface of treatment by means of the irradiating head 6a.

A small tubular irradiating head 6b is shown in Figure 5 wherein the output light beam of the fibre optics means 5 is polarised by the polarising filter 11, where a polarised light beam is produced and the last can be projected to the required surface by directing the longitudinal axis of the irradiating head 6b.

The advantage of the apparatus proposed by the invention is that it can be easily, simply applied because of making use of the fibre optics means 5. The heat generated by the incandescent lamp 2, however partly reflected by the mirror system, can not reach the irradiating head and the cooling fan 3 arranged in the housing together with the incadescent lamp 2 does not cause the bigger mass of the irradiating head 6, 6a or 6b.

By the apparatus proposed by the invention the heat energy generated in the housing can not disturb the application of the irradiating head and the treating process. The

heat generated by the incandescent lamp doesn't result in such circumstances in shortening the treatment time caused by the high heat power level of the irradiating. A further advantage of this solution is the fact that in the irradiating heads 6, 6a, 6b the optical elements can be produced also from plastics and not only from glass. This means a remarkable decrease of the costs of manufacturing.

The irradiating heads 6, 6a, 6b do not include elements applied from an electric supply and therefore there is no need of ensuring electric security of this head on the level required in the case when the irradiating head comprises elements supplied directly from the network.

Another advantage is that the irradiating head can be shaped and constructed according to the actual requirements, the output of the fibre optics means 5 can be equipped with different fitting constructions for receiving different irradiating heads. By the irradiating head selected according to the task it is e.g. possible to irradiate the inner surfaces of a living body.

The tubular or similar irradiating heads can be applied also to optical acupuncture based on point shaped light beams.

A further advantage is in the applying a more branch fibre optics means with branches connected to a common light source and equipped with more irradiating heads. This makes possible to irradiate more places of a living body simultaneously.

CLAIMS

1. Apparatus for irradiating by polarised light, comprising means for generating polarised light and a housing including an electric supply unit, an incandescent lamp with a mirror attached thereto and a cooling fan, characterised in further comprising an irradiating head (6, 6a, 6b) for applying polarised light and flexible fibre optics means (5) for connecting the incandescent lamp (2) with the irradiating head (6, 6a, 6b) being movably arranged.

2. Apparatus according to claim 1, characterized in generating means consisted of a polarising filter (8) arranged in the irradiating head (6) after a condenser lens (7).

3. Apparatus according to claim 1, characterized in generating means consisted of a polarising filter (8) arranged in the irradiating head (6) after a Fresnel lens (9).

4. Apparatus according to claim 1, characterized in generating means consisted of a Brewster's angle reflecting surface (10) arranged in the irradiating head (6a) after a condenser lens (7)

5. Apparatus according to claim 1, characterized in generating means consisted of a Brewster's angle reflecting surface (10) arranged in the irradiating head (6a) after a Fresnel lens (9).

6. Apparatus according to claim 1, characterized in generating means consisted of a polarising filter (11) arranged in the irradiating head (6b), the irradiating head (6b) constituting a tube-shaped element.

7. Apparatus for irradiating by polarised light, comprising a light source, means for generating polarised light and means for projecting irradiating light in predetermined directions, characterised in

further comprising flexible means made in form of a fibre optics means (5) for forwarding radiation power of the light source to the projecting means wherein the projecting means forming an irradiating head (6, 6a, 6b) are arranged in a way ensuring independent movement thereof on the light source.

8. Apparatus according to claim 7, characterized in comprising the means for generating polarised light in the irradiating head (6, 6a, 6b).

9. Apparatus according to claim 7 or 8, characterized in comprising at least two irradiating heads (6, 6a, 6b) connected to a common light source by means of a fibre optics means (5) including fibre optics branches connected to the irradiating heads (6, 6a, 6b).

10. Apparatus according to any of claims 7 to 9, characterized in comprising an incandescent lamp (2) as light source.

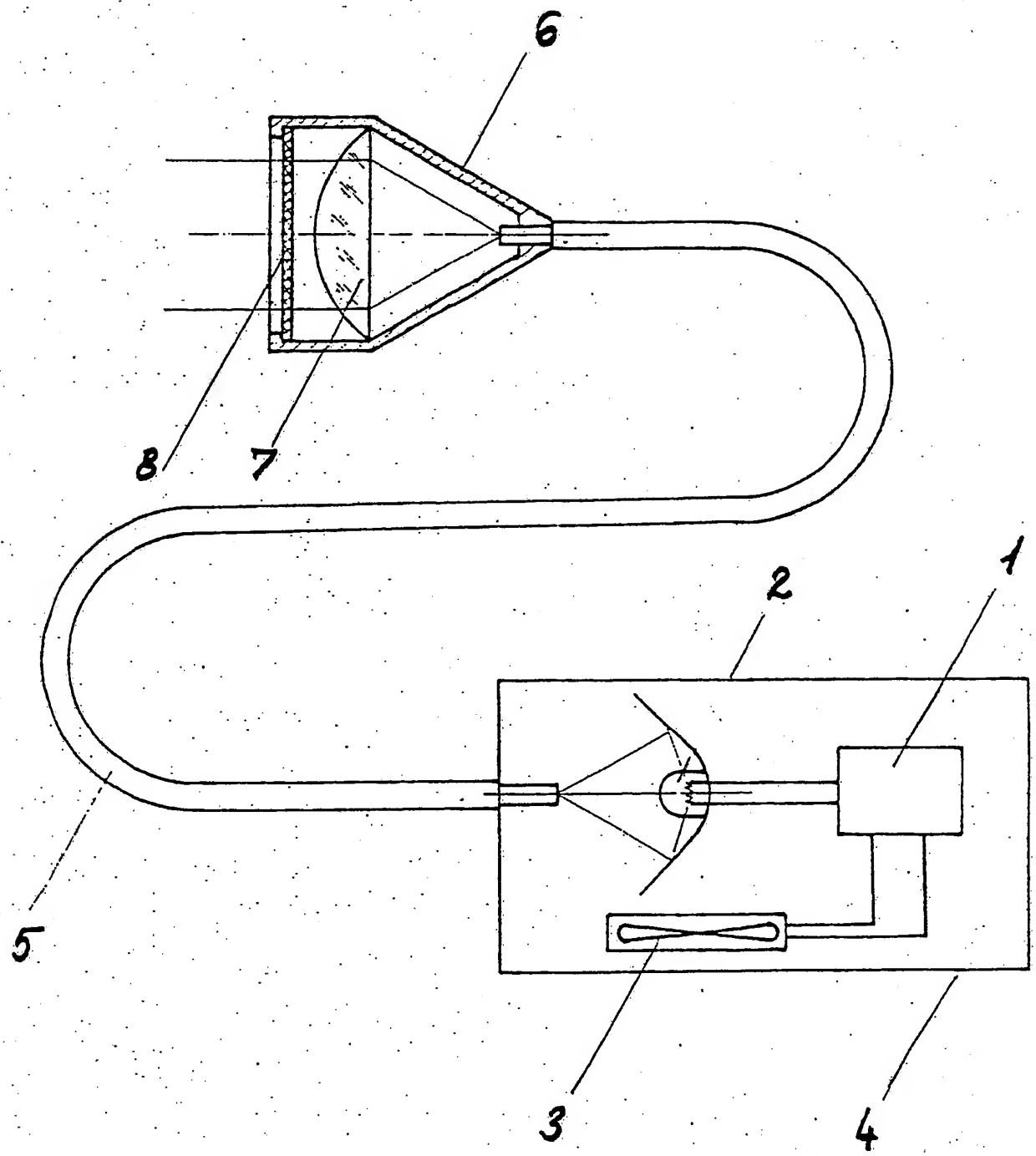

FIG. 1.

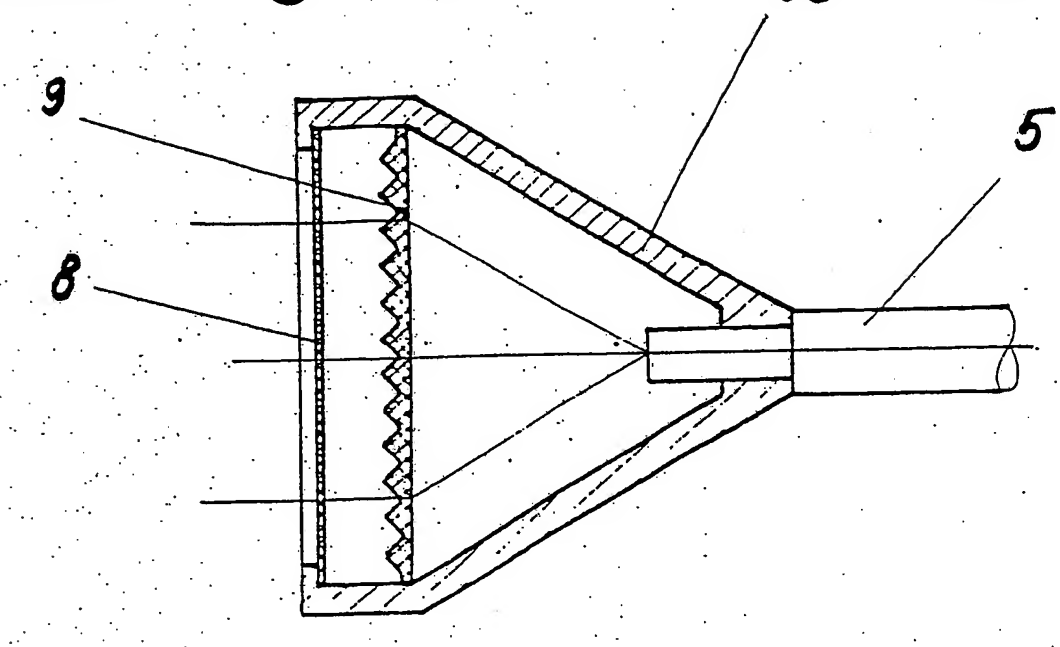

FIG. 2.

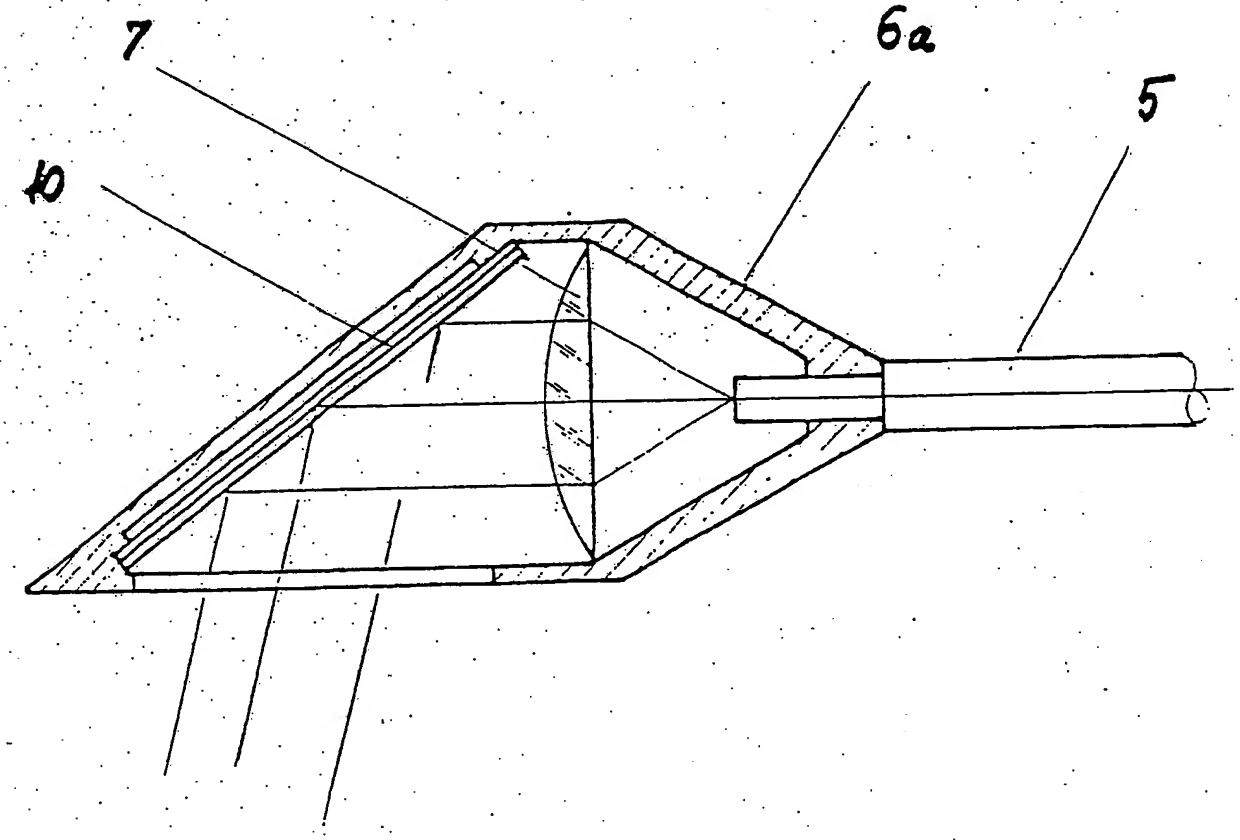

Fig. 3.

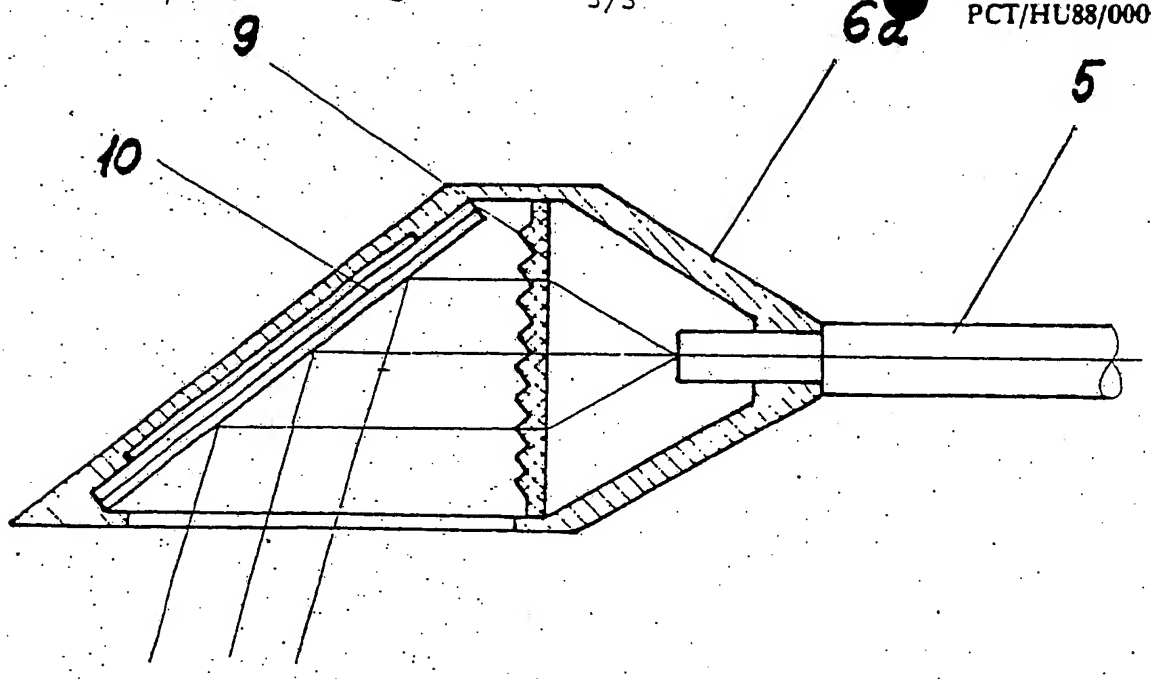

FIG. 4

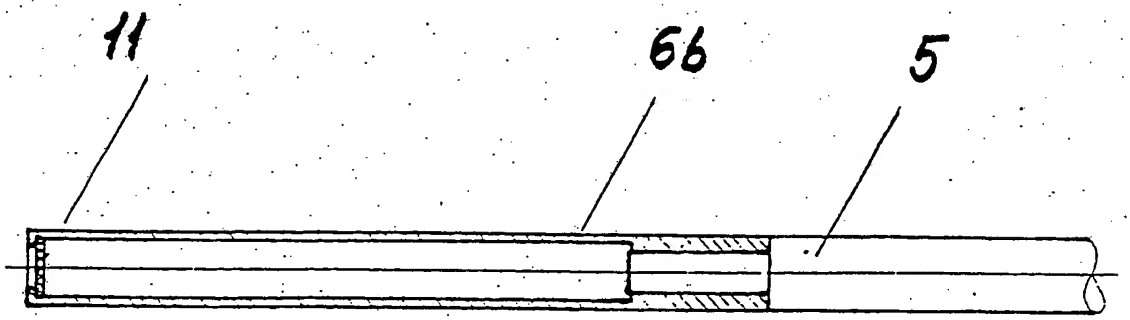

FIG. 5

INTERNATIONAL SEARCH REPORT

International Application No PCT/HU 88/00052

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC[4]: A 61 N 5/06

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
Int.Cl.[4]	A 61 N, A 61 H, A 23 C, A 23 L

Documentation Searched other than Minimum Documentation to the Extent that such Documents are included in the Fields Searched [8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category [10]	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
Y A	DE, A1, 3 220 218 (FENYÖ) 17 March 1983 (17.03.83), see claims 1,10,17,20,23,27; fig. 1-5.	(1,7,10) (2,4-6,8)
Y	GB, A, 2 012 939 (ESPE) 01 August 1979 (01.08.79), see abstract; fig. 1.	(1,7,10)
A	WO, A1, 84/04 463 (MTA KÖZPONTI FIZIKAI KUTATÓ INTÉZETE) 22 November 1984 (22.11.84), see abstract; page 3, lines 14-19.	(1-5,7)
Y A	WO, A1, 84/03 049 (AMS) 16 August 1984 (16.08.84); see abstract; page 5, lines 26-37; fig. 1.	(1,7) (2-6)
Y	DE, A1, 2 948 580 (K.K.MORITA SEISAKUSHO) 19 June 1980 (19.06.80), see claim 1; fig. 1.	(1,7)
A	DE, A, 2 308 554 (NATH) 22 August 1974 (22.08.74), see claim 1; fig. 1.	(1,7)
A	DE, A1, 2 846 471 (NATH) 08 May 1980 (08.05.80), see claims 1-3; fig. 1,2.	(1,7,10)

* Special categories of cited documents: [10]

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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
29 September 1988 (29.09.88)	07 October 1988 (07.10.88)
International Searching Authority	**Signature of Authorized Officer**
AUSTRIAN PATENT OFFICE	

International Application No. PCT/HU 88/00052

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
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Form PCT/ISA/210 (extra sheet) (January 1985)

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Anhang zum internationalen Recherchenbericht über die internationale Patentanmeldung Nr.

In diesem Anhang sind die Mitglieder der Patentfamilien der im obengenannten internationalen Recherchenbericht angeführten Patentdokumente angegeben. Diese Angaben dienen nur zur Unterrichtung und erfolgen ohne Gewähr.

Annex to the International Search Report on International Patent Application No. PCT/HU 88/00052

This Annex lists the patent family members relating to the patent documents cited in the above-mentioned International search report. The Austrian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Annexe au rapport de recherche internationale relatif à la demande de brevet international n°.

La présente annexe indique les membres de la famille de brevets relatifs aux documents de brevets cités dans le rapport de recherche internationale visé ci-dessus. Les renseignements fournis sont donnés à titre indicatif et n'engagent pas la responsabilité de l'Office autrichien des brevets.

Im Recherchenbericht angeführtes Patentdokument Patent document cited in search report Document de brevet cité dans le rapport de recherche	Datum der Veröffentlichung Publication date Date de publication	Mitglied(er) der Patentfamilie Patent family member(s) Membre(s) de la famille de brevets	Datum der Veröffentlichung Publication date Date de publication
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Fortsetzung Seite 2

physiologically acceptable wavelength range by using commercially available halogen tungsten incandescent lamps. By voltage control the real temperature of the infrared lamps is adjusted to 2500 to 2900 DEG K. A filter is preferably located in addition in front of the infrared lamp.